Resource Adequacy in MISO Zone 4

The American Petroleum Institute is submitting comments below in the format requested by the Illinois Commerce Commission. We thank you for the opportunity to provide comment and input as you develop a White Paper on the important topic of resource adequacy in MISO Zone 4.

I. Resource Adequacy Standards

A. How should resource adequacy be defined and how does resource adequacy compare with or contrast with resiliency and reliability?

Broadly speaking, resource adequacy is a review of generation to ensure that sufficient resources are available to support demand. Illinois has readily maintained sufficient resource adequacy, through the use of markets as a deregulated state. As such, any review or modification to the current system must assure a clear, fuel neutral, and attributes focused approach. Any market or policy measures aimed at ensuring sufficient resources or capacity in Zone 4, like an IPA administered capacity auction, should be guided only by a determination of resource adequacy or reliability needs and not by any other public policy concerns. Policies aimed at promoting economic development or support for a specific type of fuel or generating asset disguised as a resource adequacy fix would severely distort Illinois' competitive marketplace and continuously expose customers to changing political priorities.

Regarding measures of reliability, API supports FERC's recent unanimous rejection of a proposed rule that would have tied resilience to onsite fuel storage. Keeping resources adjacent to a generating plant has no bearing on system reliability, resilience or resource adequacy. In fact, most system disruptions are related to transmission and distribution infrastructure damage due to weather events and have nothing to do with lack of on-site fuel. An analysis by Rhodium Group shows that between 2012 and 2016, fuel supply disruptions caused less than 1 percent (0.00007% to be exact) of all substantial power outages.[1]

Furthermore, the delivery system that moves gas from production sites to power plants through pipeline infrastructure is a significant contributor to reliability. The natural gas delivery system has inherent physical attributes that contribute to a resilient power system for Illinois customers;[2]

[1] The Rhodium Group, "The Real Electricity Reliability Crisis," October 3, 2017.

[2] For a more comprehensive explanation, please refer to the Natural Gas Council White Paper "Natural Gas Systems: Reliable and Resilient." July,2017. http://www.ipaa.org/wp-content/uploads/2017/07/NGC-Reliable-Resilient-Nat-Gas-WHITE-PAPER-Final.pdf

- **Supply redundancy**—multiple pipeline interconnecting points reinforces system integrity. Therefore, a local disruption would not cascade to a system-wide problem as it would in the electric grid. As cited in a report from the Massachusetts Institute of Technology[3], the natural gas system has very few points of failure or single points of disruption that can lead to system-wide shortfalls.
- **Predominant use of compressor units that run on natural gas—** Natural gas flows average around 30 miles per hour—giving system operators plenty of time to respond to local disruptions and easily manage the flow through the system. Thus shortfalls at one point in the system tend to have only very localized effects. Also, the compressibility of natural gas makes it easy to serve as a backup supply to the system.

  Network of physical storage infrastructure— there is an extensive national network of physical storage of natural gas that ensures supply availability. Natural gas is most commonly stored underground in depleted aquifers and oil and gas fields, as well as in salt caverns. It can also be stored above ground in storage tanks as liquefied natural gas("LNG") for use at import and export facilities and at peak shaving plants, or as compressed natural gas ("CNG") for industrial and commercial uses.
- **Majority of pipelines located underground**—as most natural gas pipelines are buried underground, they are more insulated from physical damage from external forces.

B. What entities currently address resource adequacy, how do they do so, and how sufficient are such current measures?

In the electricity sector, natural gas-fired generation plays a critical role in providing cleaner power as well as grid support to new, innovative and complementary energy technologies. System reliability should be interpreted in a results-oriented framework—grid operators and regulators should focus on continued, affordable, reliable delivery of energy to customers that is a direct result of different generating attributes. Reliability does not necessarily come from a diverse portfolio of fuels, but rather from a diverse array of engineering attributes. The focus on attributes, rather than fuel type or favored technology, is increasingly important as Illinois works to integrate more innovative power sources into its portfolio.

Natural gas generation offers a variety of reliability attributes that support the modernization of the electric grid. A 2017 report by the Brattle Group[4] identified the necessary attributes of power generation and then outlined how

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[3] Massachusetts Institute of Technology, Lincoln Laboratory, "Interdependence of the Electricity Generation System and the Natural Gas System and Implications for Energy Security," May 15, 2013.

[4] Brattle Group, "Diversity of Reliability Attributes—A Key Component of the Modern Grid." (Two page fact sheet about the study's findings— prepared by the American Petroleum Institute). 2017, http://www.api.org/~/media/Files/Policy/Natural-Gas-Solutions/Keys-to-Ensuring-Grid-Reliability.pdf

well different technologies can provide these services. As the figure below shows, natural gas generating units are advantaged in providing the entirety of reliability attributes;

<u>Reliability Attributes and Technology</u>

	Natural Gas - CC/CT/RICE/ Aeroderivate	Coal	Nuclear	Wind	Solar	Pondage Hydro	Run of River Hydro	Demand Response	Storage
Generation	●	●	●	●	●	●	●	N/A	N/A
Dispatchability	●	●	◍	○	○	●	○	●	●
Security of Fuel Supply	●	●	●	○	◍	●	◍	◍	◍
Start Times	●	○	○	N/A	N/A	●	N/A	●	●
Ramp Rates	●	◍	○	N/A	N/A	●	N/A	●	●
Inertia	●	●	●	◍	○	●	●	○	○
Frequency Response	●	◍	○	○	○	●	○	○	●
Reactive Power	●	●	●	◍	◍	●	◍	N/A	N/A
Minimum Load Level	●	◍	○	N/A	N/A	●	N/A	●	●
Black Start Capability	●	N/A	N/A	○	○	●	●	N/A	◍
Storage Capability	N/A	N/A	N/A	N/A	N/A	◍	N/A	N/A	●
Proximity to Load	●	◍	◍	◍	●	○	○	●	●

● Relatively Advantaged
◍ Neutral
○ Relatively Disadvantaged

Source: Diversity of Reliability Attributes, A Key Component of the Modern Grid, The Brattle Group

Attribute	**Description**
Generation capability	No attribute is more fundamental to system requirements than the ability to generate electrical energy.
Dispatchability	Dispatchable resources have the ability to change their output or consumption levels in response to an order by the system operator. While virtually all resources are dispatchable to some degree, some have greater capabilities than other and shorter required lead times.
Security of fuel supply	Security of fuel supply measures the dependability of a resource's energy inputs, or fuel.
Start times and ramp rates	Closely related to dispatchability, start times and ramp rates determine the speed at which resources can respond to system operators' orders to increase and decrease electricity delivered to the grid.

Inertia and frequency response capability	Inertia and frequency response are attributes of resources that help the system meet the requirement to maintain frequency stability.
Reactive power capability	The ability to provide reactive power is an attribute necessary for meeting the system's requirement to maintain voltage within certain limits to prevent generator operation malfunctions or, in the worst case, cascading blackouts.
Minimum load level	A resource's minimum load level describes the lowest level of electrical output the resource can continuously send to the grid.
Black start capability	Black start capability is the ability of a power plant to restart without relying on the transmission network to deliver power.
Storage capability	Resources with the attribute of storing electricity help the system meet multiple requirements including meeting bulk demand, following load or net load, and maintaining frequency stability, but not all resources with the ability to store electricity contribute to meeting all of the requirements.
Proximity to load	The ability to site resources close to load is an attribute that helps the system meet bulk demand and maintain voltages. Resources that are close to load that also have the ability to generate reduce transmission losses and transmission congestion.

Source: Diversity of Reliability Attributes, A Key Component of the Modern Grid, The Brattle Group

In addition to being a fuel that powers generation that supports network reliability and resilience goals, natural gas supplies the power for innovative, clean, and resilient technologies deployed at the local level or behind the customer meter. Power generation technologies such as fuel cells and combined heat and power (CHP) provide the dependable electricity for microgrids and customers requiring a high degree of reliability and power quality, seeking greater efficiency and cost reductions, or desiring to ride through extended outages. Natural gas generation is also uniquely capable of quickly ramping up and down output to match the changing energy needs throughout the day, allowing for more renewable energy integration.

II. Resource Adequacy Measurement

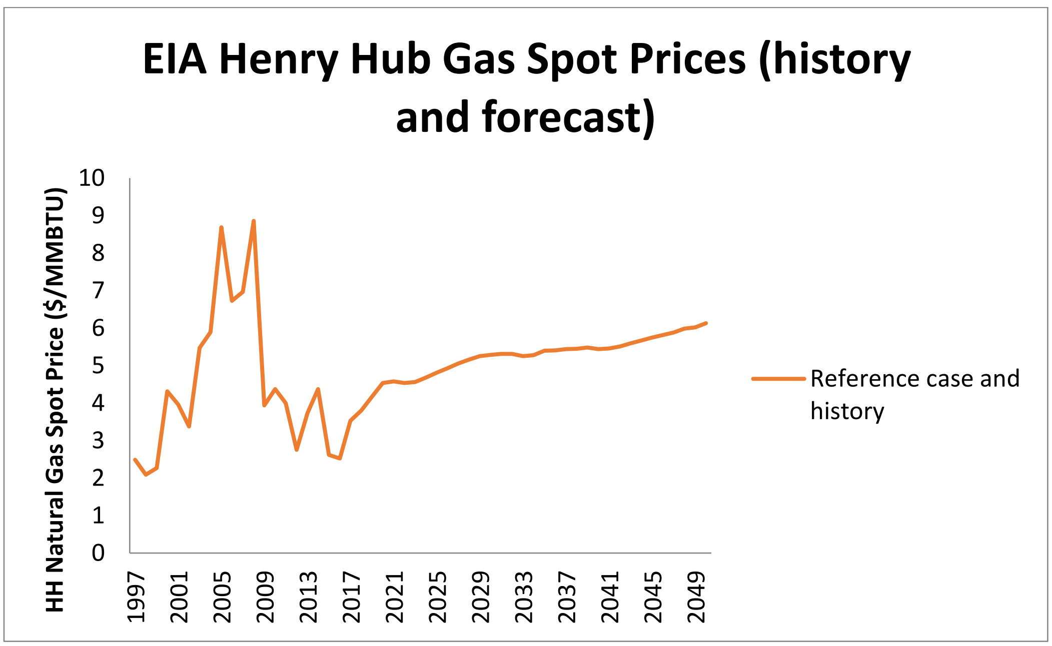
A. How much generation is currently available to meet Zone 4 resource adequacy requirements?
B. What generation resources formerly meeting Zone 4 resource adequacy requirements have recently been lost due to retirement, derating, declining capacity factor, or otherwise?

C. What are current generation resources available to meet Zone 4 resource adequacy requirements at risk of becoming unavailable going forward and what are the implications of the loss of such resources?

D. What are the prospects for new generation resources becoming available to meet Zone 4 resource adequacy going forward?

The prospect for natural gas to be a fuel of choice in new generation builds in Illinois and throughout the country is quite robust particularly because of its forecasted abundance. Natural gas is a plentiful resource capable of fueling Illinois' power needs—new discoveries and technological breakthroughs in the years since the beginning of the shale revolution position gas generation well to continue competing to provide dispatchable, affordable, and clean energy. We would like also to mention that through 2049 the EIA, even in its reference case, does not predict natural gas spot prices to come anywhere near the high prices of about a decade ago.

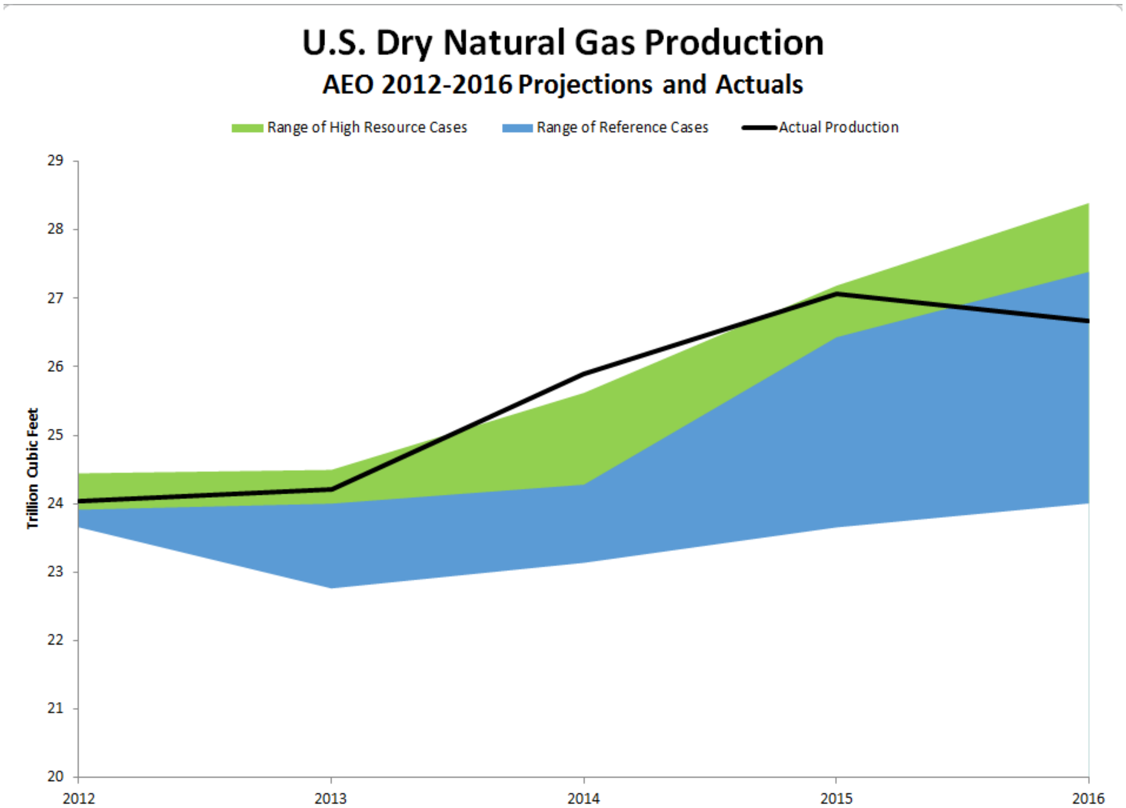
Chart I—EIA forecast that includes historic prices, EIA reference case[5]



Furthermore, we would like to point out that while the above price series (with forecasts starting in 2017) uses the EIA Reference Case, the EIA High Oil and Gas Resource and Technology Case has often provided the better representation of natural gas supply-demand fundamentals looking back. The below chart compares the range of EIA reference cases in blue and high oil and gas resource and technology cases in green from 2012-2016. The black line graph shows actual production that occurred those years.

[5] Historic prices— https://www.eia.go v/dnav/ng/hist/rngwhhda.htm , forecast The Energy Information Administration, "Annual Energy Outlook 2017." Reference case table A3: Energy Prices by Sector and Source https://www.eia.gov/outlooks/aeo/. Note that forecast prices start in 2017.

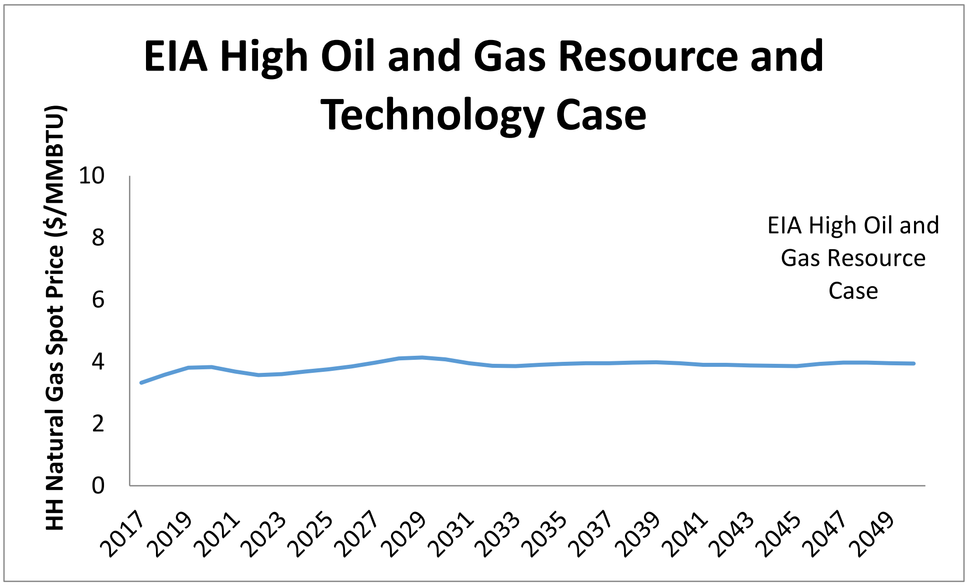
Chart II—EIA forecast that includes historic prices, EIA reference case[6]



EIA's price trajectory, based on production numbers in the High Oil and Gas Resource Case[7] is below and, unsurprisingly, are substantially lower than the Reference Case.

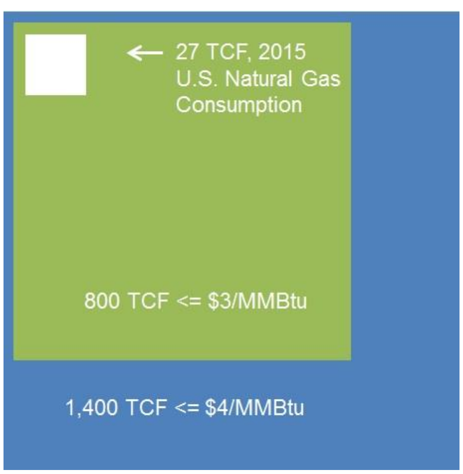
[6] Source: EIA, Annual Energy Outlooks 2012 – 2015; Actual Production
[7] The Energy Information Administration, "Annual Energy Outlook 2017." High Oil and Gas Resource and Technology table A3: Energy Prices by Sector and Source https://www.eia.gov/outlooks/aeo/

Chart III—EIA forecast, High Oil and Gas Resource and Technology case



[8]

Additionally, a 2016 report by IHS Markit (then known as IHS) helps explain the simultaneous dynamic of high production in a potential sustained low commodity price environment. In their 2016 "Shale Gas Reloaded: The Evolving View of North American Natural Gas Resources and Costs," experts identified 1,400 tcf of natural gas in the U.S. Lower 48 and Canada that is economically and technically recoverable at breakeven prices of $4/MMBTU with more than half (approximately 800 tcf) of this resource base recoverable at prices of $3/MMBTU[9]. The below figure illustrates these production numbers in relation to 2015 natural gas consumption.



[8] Ibid.

[9] IHS-Markit, "North America's Unconventional Natural Gas Resource Base Continues to Expand in Volume and Decrease in Cost." February 23, 2016. http://news.ihsmarkit.com/press-release/north-americas-unconventional-natural-gas-resource-base-continues-expand-volume-and-de

Beyond high production levels, EIA also forecasts that even as the U.S. significantly expands its LNG and pipeline export capacity, it would remain net long on natural gas through 2050.[10]

As we mentioned in previous comments during this process, Illinois is well suited to realize economic, environmental, and resource adequacy benefits of natural gas use in power generation. Natural gas generation can help Illinois regulators and policymakers advance the state's energy goals of giving citizens access to reliable, resilient, affordable, and clean energy.

F. What non-generation resources are and may be available to meet resource adequacy and how do such resources impact resource adequacy?
G. How well do existing programs and initiatives predict future resource adequacy?

III. Market Design Impact on Resource Adequacy

A. What alternative opportunities are available to resources that could otherwise be used to meet resource adequacy in Zone 4 and how do these opportunities impact Zone 4 resource adequacy?
B. How does the transmission system impact resource adequacy?
C. How do facilities owned by municipals and cooperatives affect resource adequacy?

D. How does bilateral contracting, self-supply, and fixed resource adequacy planning affect resource adequacy?

E. How do so-called out-of-market revenues (revenues separate and apart from those obtained in wholesale markets (e.g., Zero Emission payments or renewable energy credits) impact resource adequacy?

A competitive marketplace, as envisioned by the Illinois Public Utilities Act, should benefit all customers. Any out of market payment runs contrary to the foundation of a competitive market, in which providers of energy compete by responding to economic signals to provide customers with affordable, reliable, and cleaner energy.

Proposed solutions that require additional government intervention or mandates may have some limited success in the short run, but their impact will come at a cost. Subsidies only beget more subsidies. By sticking to a competitive framework, the economic impacts are multiplied and achieve better, more efficient outcomes than subsidies provide.

[10] U.S. EIA. Table: Natural Gas Supply, Disposition, and Prices. Annual Energy Outlook 2017. https://www.eia.gov/outlooks/aeo/data/browser/#/?id=13-AEO2017&region=0-0&cases=ref2017&start=2015&end=2050&f=A&linechart=ref2017-d120816a.3-13-AEO2017~ref2017-d120816a.6-13-AEO2017~ref2017-d120816a.23-13-AEO2017&ctype=linechart&sourcekey=0

IV. Scope

A. Please provide commentary on any relevant substantive or process issue you believe has not been adequately captured in the Sections above.

V. Potential Policy Options

A. What changes, if any, should be made to enable better measurement and assessment of what resources are available to meet Zone 4 resource adequacy requirements?
B. What changes, if any, should be made to MISO's capacity construct including to the MISO planning resource auction to better ensure resource adequacy?
C. What changes, if any, should be made to MISO's energy or ancillary service constructs that would help maintain resource adequacy?

D. What actions should the Illinois Commerce Commission and/or the Illinois Power Agency take, if any, to address resource adequacy assuming no new legislative authority?

E. What actions should the Illinois General Assembly take, if any, to address Zone 4 resource adequacy?

F. Please describe any additional potential policy option(s) you would like to see considered or that you would recommend not be considered.

G. Is it important for any selected policy option to be market-based? If so, why? If not, why not?

Any action by the ICC, the legislature, and/or the IPA to address this issue should be anchored to transparent metrics and driven only by resource adequacy needs. Illinois regulators should not account for other policy initiatives like local economic development or subsidizing a certain fuel or technology in addressing a resource adequacy issue. As we have consistently addressed in previous comments, out of market payments or subsidies only beget more subsidies. Generation assets excluded from FEJA triggered payments, including natural gas generation, should not be afforded of subsidy or out of market revenue just because it was left out of the program. All generating assets or investments in Illinois ought to compete on a level playing field to provide the affordable, reliable, clean, and dispatchable power to meet the needs of Illinois customers. A market-based approach can protect Illinois customers from any politically induced volatility. Illinois' power system should be driven by system needs, not shifting political priorities. The objective of system planning ought to be to promote competition in the energy landscape to best serve Illinois citizens, not to provide windfalls to one company or fuel source on the backs of customers.